PEEL HILL FARM SENTINEL STUDY

Multi-epoch evidence of changing surface water, ground disturbance and mapped elevation loss, 2017-2026

Working paper v0.1

Ground Truth & Governance - The Open Record

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Status: initial project working draft. Image dates and filenames are included where reliably matched. Remaining archive references require final verification before publication.

Series Note: This report forms part of the July 2026 report series, which is itself included within the wider Fylde Papers archive.

0. SUMMARY

Peel Hill Farm is a strong sentinel location because a compact group of fields contains many of the recurring feature classes documented elsewhere across the wider Fylde study area. The reviewed corpus includes a long-lived pond and seepage area, changing wet and iridescent surface conditions, pale or mineral-like deposits, sinuous and branching lines, circular and irregular exposed-ground features, an excavated drainage intervention, vegetation contrasts, resident testimony of local lowering, and mapped negative elevation change between the 2018 and 2022 LiDAR epochs.

The evidence is significant because it is not a single photograph or isolated anomaly. It spans repeated UAV surveys from 2017 to 2026, Google Earth chronology, LiDAR differencing, dry- and wet-season conditions, and observations from different parts of the same connected slope. Several manifestations were photographed during the interval between the two LiDAR surveys, while later features remain visible within or beside the mapped lowering pattern.

The present evidence does not establish one cause for every feature. Livestock, field management, drainage works, seasonal saturation, perched water, soil variability and local excavation remain important alternatives or contributors. However, the combined record supports a testable working hypothesis: surface water, shallow groundwater and sediment pathways have reorganised through time within a field system that has also undergone measurable elevation change. The apparent movement of expressions from the former pond area toward downslope scarp-like features, the Main Drain and Carr Bridge Residential Park makes this a high-priority comparison and monitoring area.

The proportionate response is not to declare a cause from imagery. It is to preserve the chronology, digitise the recurring features, intersect them with the original LiDAR raster, obtain repeat elevation data, review drainage history, and undertake targeted water, sediment and ground-level checks before further alteration obscures the evidence.

1. PURPOSE AND SCOPE

This working paper records the first integrated review of the Peel Hill Farm image corpus as a sentinel study. Its purpose is to describe what is visible, establish the temporal and spatial relationships between observations, identify where independent datasets correspond, and define the checks needed to distinguish competing explanations.

The paper is observational. Terms such as seepage, lowering, scarp-like, mineral-like and iridescent describe visible or measured characteristics. They do not by themselves identify a source, chemical composition or subsurface mechanism. Where interpretation is offered, it is stated as a hypothesis or question rather than a conclusion.

The study area considered here includes the former pond and upper fields, the western and southwest quadrants, the horse and livestock paddocks, the slope toward the previously reported Location 4 features, the Carr Bridge Residential Park boundary, and the relation to the Main Drain and Location 10 farther south.

Figure 1. Southwest Peel Hill Farm and Carr Bridge Residential Park context, 10 July 2026, DJI_0616(1).JPG. The view establishes the proximity of the monitored fields, residential edge and downslope terrain. Individual mechanisms cannot be identified from this wide image alone.

2. WHY PEEL HILL FARM FUNCTIONS AS A SENTINEL LOCATION

A useful sentinel location should contain recurring, measurable and comparable expressions that can be followed through time. Peel Hill Farm meets that test for five reasons.

First, the imagery provides unusually dense temporal coverage. The wet area was photographed repeatedly during autumn 2017, with further coverage in 2018, 2019, January 2026 and July 2026. This allows the site to be treated as an evolving system rather than a collection of disconnected still images.

Second, the site contains several feature classes within one slope system: open water, diffuse saturation, tonal and iridescent change, sediment or residue, narrow lines, branching patches, circular depressions, larger irregular exposed-ground features, drainage intervention and vegetation response.

Third, the observations can be compared with an independent elevation dataset. The 2018-2022 LiDAR difference raster records negative elevation change in parts of the same wider field system, including a selected pixel value of -0.140906 m. That value is local to one raster cell and must not be generalised across the whole area, but the broader negative-change pattern is a high-priority spatial comparator.

Fourth, the site connects directly to occupied residential land and to downslope drainage. Carr Bridge Residential Park lies along the southwest edge, while Location 10 and the Main Drain provide possible lower hydraulic outlets. This increases both the value of the site for process understanding and the need for careful, proportionate investigation.

Fifth, a resident reported that fields behind the residential area had sunk. This is not a survey measurement and should be recorded as testimony, not proof. Its significance is that it refers to the same area in which the imagery and LiDAR already justify formal comparison.

3. EVIDENCE BASE AND METHOD

The review used a three-pass method. Pass 1 recorded what is visible. Pass 2 compared the feature with earlier or later epochs. Pass 3 considered possible explanations while retaining uncertainty. The principal sources were UAV JPEG and DNG imagery, Google Earth chronology, the 2018 and 2022 LiDAR difference product, existing Location 4 and Location 10 records, and field knowledge gathered during the July 2026 visit.

The compiled observation register treats Peel Hill Farm as a parent sentinel record with child observations. This prevents the area from being forced into a single causal claim and allows each feature to be tested separately against land management, livestock use, drainage, rainfall, soil, elevation and structural context.

3.1 Evidence classes now represented

Evidence class	Examples reviewed	Independent support	Current status
Surface water and seepage	Persistent pond, diffuse flooded footprint, downslope wet and stained areas	Repeated epochs; relation to drain and slope	Definite change; source unresolved
Ground form	Scarp-like patches, circular holes, elongated break, local exposed ground	LiDAR negative change in wider area	Visible features; mechanism unresolved
Material and colour	Red-brown water, grey or silvery film, pale or whitish deposits, reflective points	Recurrence across epochs and locations	Composition untested
Drainage intervention	Old red pipe, excavated drain or trench, later burial beneath mud	January and July 2026 comparison	Persistent disturbed area
Vegetation response	Greener, paler, bare-centred and branching patterns	Dry- and wet-season imagery	Mixed causes remain possible
Human testimony	Resident report of local sinking	Spatially overlaps priority area	Anecdotal; survey needed

4. CHRONOLOGY

4.1 Autumn 2017: repeated wetting, tonal change and surface disturbance

The 2017 sequence is central to the sentinel value of the site. User-supplied dates include 6 October 2017, 13 October, 14 October, 22 October, 23 October, 25 October, 29 October, 31 October and two views from 1 November. The 6 October date appears out of order in the uploaded sequence and should be checked against the source metadata before publication. A further 30 November 2017 frame was also identified during review.

Across these dates, the wet feature changes from a concentrated pool to a broader saturated footprint with variable grey, silvery, brown and red-brown tones. The visible water area and the larger affected footprint do not change in the same way. At several dates the principal pool is surrounded by a much wider zone of saturated vegetation, reflective film or pale surface response. Narrow extensions and track-like lines cross or leave the wet area. By 1 November, mound-like disturbed points are also visible nearby.

The tonal changes may reflect changing water depth, suspended sediment, iron oxidation, organic films, microbial activity, illumination or a combination. Iridescence is visually important but is not chemically diagnostic. The image record supports repeated surface-water and sediment change; it does not identify hydrocarbons or salinity without sampling.

Figure 2. Upper Peel Hill Farm on 14 October 2017. Left: pond-field context, DJI_0241 (2).JPG. Right: irregular pale core-and-tail or branching expression, DJI_0243 (2)(1).JPG. The pale material and reflective points cannot be identified from imagery alone; stone, wet sediment, debris and other surface material remain possible.

4.2 2018: persistence under contrasting seasonal conditions

The pond remains visible in July 2018 under dry conditions and again in autumn 2018. The 25 October and 6 November image sets show changing water extent, exposed perimeter, gateway and boundary disturbance, and field-interior tonal variation. The wider hollow is larger than the open-water pool, indicating that the active surface-water footprint cannot be represented by the pond perimeter alone.

Seasonal rainfall, grazing and access routes are major confounders. Even so, the recurrence of field-interior and boundary-following expressions justifies matched mapping rather than dismissal as one-off livestock damage.

4.3 2019: distributed manifestations during the LiDAR interval

The May and September 2019 imagery shows the pond embedded within a broader pattern of pale, dark, muted and greener patches. On 22 September 2019, the open water has a green opaque appearance and a broad exposed margin, while irregular manifestations occur in adjoining pasture. These observations fall between the 2018 and 2022 LiDAR surveys, which makes them especially valuable for testing whether visible expressions coincide with later measured elevation change.

Figure 3. Peel Hill Farm on 22 September 2019. Left: pond within the wider field pattern, DJI_0290.JPG. Right: closer pond-field condition, DJI_0294.JPG. Colour and opacity may reflect water depth, vegetation, suspended sediment, organic processes or illumination; composition is not established by the images.

4.4 2018-2022: measured negative elevation change

The LiDAR difference product records negative elevation change across parts of the Peel Hill Farm field system. A selected pixel in the southwest comparison area returns -0.140906 m. Displayed negative-change classes include values around -0.104 m to -0.155 m, with shallower classes extending toward zero. The exact selected value belongs only to that cell. Registration, vegetation, surface cover and raster uncertainty must be considered before interpreting any individual pixel.

The important current finding is cross-dataset correspondence. Several photographic manifestations occur during the LiDAR interval, and later 2026 features are located within or beside the wider negative-change pattern. A

formal digitised intersection is still required. Until that is completed, the correspondence should be described as spatially suggestive and high priority, not as proof that each feature was caused by subsidence.

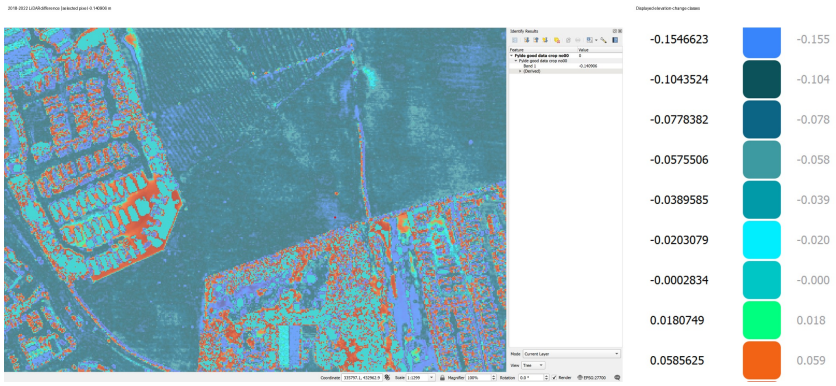

Figure 4. 2018-2022 LiDAR difference comparison. The selected raster pixel is -0.140906 m; the accompanying legend shows the displayed change classes. The value is pixel-specific and must not be generalised across the field. Raster registration, cover and uncertainty require formal review.

4.5 January 2026: drainage intervention and persistent wet ground

January 2026 imagery records the old red drainage pipe within a larger disturbed area and a narrow excavated channel or trench. The ground is visibly wet and muddy. This establishes that the pipe was already in situ before the July dry-season survey and provides a useful temporal comparator for later burial or obscuration by mud.

The pipe demonstrates deliberate drainage or ground intervention but does not explain why intervention was required. Drainage records, landowner information and matched ground photographs would materially improve interpretation.

4.6 July 2026: dry-season endpoint

July 2026 provides a valuable drought or dry-season endpoint. Open water is absent from the former pond position, which is expressed instead as a subtle circular or diffuse residual surface pattern. The pond appears to have been filled or otherwise removed. Imagery alone cannot determine whether the underlying water table fell, water was diverted or pumped, the hollow was mechanically drained, or fill was placed under temporary dry conditions. The infilling is nevertheless significant because it changes the visible endpoint of a long-running wet feature and may conceal the earlier ground condition.

Figure 5. Residual dry-season surface pattern at the former pond area, July 2026. The image supports loss of visible open water but does not establish whether the cause was water-table decline, drainage, pumping, infilling or a combination. Exact source-frame verification remains required before publication.

Elsewhere in the southwest quadrant, the dry-season imagery shows a cluster of large circular and irregular exposed-ground features along and across a fence line. Their grouping, size and position downslope of the earlier pond and pale-material areas make them a principal sentinel feature. Livestock congregation, wallowing, feeding, excavation and drainage remain possible contributors, but the features warrant mapping and historical comparison rather than being treated as background pasture damage.

Figure 6. Location 4 or scarp-hole group, 16 July 2026. Left: wider relation, DJI_0775.JPG. Right: clustered circular and irregular exposed-ground features, DJI_0774.JPG. Depth, active movement and cause cannot be measured from these aerial views; livestock and land-management explanations must be tested against the temporal and LiDAR record.

The old red pipe area remains visibly distinct in July. Despite dry conditions and its uphill position, the central material appears darker and locally reflective than the surrounding exposed soil. This is consistent with residual moisture but does not prove active seepage. Shade, organic material, pipe contents or recent disturbance remain alternatives.

16 July 2026 | old red drainage pipe and dark disturbed ground

Figure 7. Old red drainage pipe and disturbed ground, 16 July 2026, DJI_0803.JPG. The darker central material appears wet relative to surrounding bare soil, but image tone alone cannot establish active seepage or composition. January 2026 comparison is required.

A narrow pale sinuous line crosses another field and broadens into a branching or fan-like patch with a different reflective response. The line could be a livestock path, compacted track, exposed substrate, deposited mineral material, drainage expression or a combination. Its significance lies in the combination of geometry, dry-season visibility and recurrence of pale or salt-like material elsewhere.

16 July 2026 | sinuous pale line widening into a branching pale patch

Figure 8. Sinuous pale line and broadened branching patch, 16 July 2026, DJI_0748.JPG. The image records geometry and contrast only. Composition and mechanism are untested; livestock use, compaction, exposed soil and mineral deposition remain alternatives.

Numerous smaller pale-grey or whitish manifestations are also distributed through pasture uphill of the scarp-hole group. Some may be stone, wool, dung, debris or exposed substrate. The reason they remain a comparison priority is not their colour alone, but their distribution beside other disturbed features and the user-reported recurrence of similar material at earlier wet points and pond margins.

Figure 9. Pale or whitish surface manifestations in southwest Peel Hill Farm, 16 July 2026. The image does not identify the material. Stone, debris, wool, dung, residue and exposed substrate remain possible; spatial recurrence and association should be tested rather than assumed.

Near the residential edge, high-magnification review identifies an elongated dark surface break terminating in a broader exposed patch. Its depth and continuity cannot be resolved from the oblique DNG view, but it is a direct feature rather than merely contextual field mottling. The feature should be mapped against the LiDAR surface and earlier imagery.

16 July 2026 | elongated surface break and exposed patch near residential edge

Figure 10. Elongated surface break and exposed patch near the residential edge, 16 July 2026, crop from DJI_0829.DNG. The crop is highly magnified. Depth, continuity and cause cannot be determined from this image alone.

A separate tonal geometry appears to continue across a boundary into the engineered horse paddock. The visual continuity is potentially useful because the engineered surface provides a different land-use context. However, the current observation is based on an annotated oblique frame and requires matched overhead imagery, elevation data and construction history before it can be treated as a physical continuation.

July 2026 | user annotation showing tonal geometry continuing into engineered horse paddock

Figure 11. User annotation of a tonal geometry continuing toward and into the engineered horse paddock, July 2026. The red outline records the observed visual alignment; it is not a surveyed boundary or proof of subsurface continuity.

5. INTEGRATED OBSERVATIONS

5.1 The pond is one phase of a larger wet-ground system

The chronology shows that the open-water pool was repeatedly smaller than the surrounding saturated or altered footprint. The feature should therefore not be analysed only as a pond. It is better treated as a central wet point within a larger area of changing surface-water, vegetation and sediment response.

5.2 Apparent downslope organisation

Several observations form a plausible upslope-to-downslope sequence: the former pond and autumn seepage area; narrow lines and pale deposits; the scarp-hole group; disturbed drainage features; the residential boundary; and the Main Drain or Location 10 farther south. The apparent sequence is consistent with shallow lateral water or sediment movement, but it has not yet been demonstrated by hydraulic measurements or tracer evidence.

5.3 Surface colour and iridescence vary through time

Grey, silvery, brown, red-brown and green appearances recur at different epochs. Such changes can arise from iron oxidation, suspended sediment, water depth, organic films, microbial activity, vegetation and lighting. The photographs establish changing surface conditions. They do not establish a chemical source. This distinction is essential in any regulator-facing account.

5.4 Ground disturbance is distributed, not isolated

The July 2026 review identified large circular and irregular exposed areas, a separate elongated break, pale-material clusters, a sinuous line and branching patch, and a persistent pipe disturbance. Earlier imagery adds pond-margin manifestations, stony or reflective exposures and repeated field-wide tonal changes. Their multiplicity is one reason Peel Hill Farm should be treated as a sentinel system.

5.5 LiDAR adds independent weight, but not automatic causation

The measured negative elevation change materially strengthens the case for investigation because it is independent of visual interpretation. It does not mean every photographed patch is subsidence. The correct next step is to digitise the photographic features and calculate their position relative to the full raster, neighbouring control areas and uncertainty bounds.

5.6 The connection to CBRP and the Main Drain is a testable question

Carr Bridge Residential Park contains its own reported manifestations, while Location 10 and red seepage along the Main Drain lie downslope. The visual similarity and topographic relation justify asking whether these are connected expressions of one wider shallow-water and ground-adjustment system. They do not yet prove that connection. A combined PHF-CBRP-Main Drain map is therefore one of the highest-value next products.

6. WORKING INTERPRETATION

The present corpus is most consistent with a hydrologically active and changing shallow-ground system in which water storage, discharge points and sediment pathways have altered through time. Measured elevation change may have modified local gradients, created or enlarged shallow lows, redirected perched or shallow groundwater, or interacted with existing drains and livestock disturbance.

One plausible sequence is that the upper pond area acted as a recurrent storage or discharge point during 2017-2019; drainage or ground intervention then altered the visible expression; water and sediment continued to exploit lower pathways; and dry-season 2026 imagery revealed residual deposits, depressions and exposed-ground features after open water had disappeared. This is a hypothesis to test, not a conclusion.

Other explanations could account for some or many observations: seasonal rainfall and waterlogging; field drainage; deliberate infilling; soil compaction; livestock paths, feeding and wallowing; local excavation; differences in grazing and vegetation; or natural soil heterogeneity. The sentinel approach is valuable precisely because it allows these alternatives to be tested feature by feature against the chronology and independent elevation data.

7. SIGNIFICANCE

The importance of Peel Hill Farm does not depend on proving a particular industrial cause at this stage. The site already meets a lower and more defensible threshold: it contains repeated hydrological and ground-surface changes, measurable elevation loss in the wider area, drainage intervention, direct proximity to residential property, and possible continuity toward a public drainage corridor.

The record therefore justifies targeted professional assessment and evidence preservation. Further infilling, drainage alteration, excavation or land management could remove or obscure the very features needed to determine what has happened.

8. RECOMMENDED CHECKS

1. Complete the image chronology from source metadata, including confirmation of the 6 October 2017 entry and final matching of all 2017 seepage frames.

2. Digitise the pond perimeter, saturated footprint, scarp-hole group, pipe disturbance, pale line, elongated break and principal material expressions as separate child features.

3. Intersect those features with the original 2018-2022 LiDAR raster, recording local ranges, profiles and control locations rather than relying on one selected pixel.

4. Acquire new repeat LiDAR, photogrammetric or survey-grade elevation data before further alteration of the fields.

5. Obtain drainage, excavation and pond-infill records, including the purpose and installation history of the old red pipe and trench.

6. Compile rainfall and soil-moisture context for the principal imagery dates and compare matched wet- and dry-season views.

7. Undertake lawful ground-level inspection of selected features, including scale, depth, soil condition, moisture, conductivity, pH and visual sediment description.

8. Where water or wet sediment is present, use an accredited sampling plan capable of distinguishing iron, salinity, hydrocarbons, major ions and other plausible sources.

9. Create a combined PHF-CBRP-Location 10-Main Drain spatial synthesis to test the apparent downslope relationship.

10. Record resident and land-manager observations with dates and locations, keeping testimony separate from measured evidence.

9. CONCLUSION

Peel Hill Farm is now established as a high-priority sentinel location within the wider Fylde study. The value lies in the convergence of evidence: dense temporal imagery, multiple recurring feature classes, a former persistent pond and seepage area, later dry-season depressions and material expressions, drainage intervention, resident testimony and independently mapped elevation change.

The corpus does not yet prove one cause or a direct connection to every downslope manifestation. It does show that the area cannot reasonably be reduced to a single pond, routine livestock damage or isolated field mottling without further analysis. The evidence is sufficient to justify a structured professional comparison and proportionate field investigation.

The next phase should preserve the observational discipline of the project: map first, compare like with like, separate direct observation from interpretation, test ordinary explanations, and only then assess whether the PHF, CBRP and Main Drain manifestations form one connected landscape-system process.

Appendix A. WORKING CHRONOLOGY AND ARCHIVE REFERENCES

Date / period	Area or feature	Image reference	Current note
6 Oct 2017	Wet area / pond sequence	Upload U8; filename to match	Date supplied by user; check

			source metadata because sequence order is unusual.
13 Oct 2017	Wet area / pond sequence	Upload U1; filename to match	Broad water and saturated footprint.
14 Oct 2017	Pond and nearby manifestations	DJI_0241 (2).JPG; DJI_0243 (2) (1).JPG	Early pond context and pale branching or stony expression.
22-31 Oct 2017	Changing wet footprint	Uploads U3-U7; filenames to match	Repeated changes in water extent, tone, reflective film and surrounding saturation.
1 Nov 2017	Wet area and mounds	Uploads U9-U10; filenames to match	Two views, including nearby mound-like points.
30 Nov 2017	Seepage	Filename to match	Additional late-autumn comparator identified during review.
17 Jul 2018	Dry-season pond	Comparison image set	Pond persists with reduced water and exposed margin.
25 Oct and 6 Nov 2018	Pond, boundaries and gateways	Comparison image sets	Autumn wetness and field-interior expressions.
23 May 2019	Upper PHF fields	DJI_0188, 0189, 0191, 0196, 0197	Multiple distributed field expressions.
22 Sep 2019	Pond and wider manifestations	DJI_0290, 0292, 0293, 0294	Principal between-LiDAR photographic comparator.
2018-2022	Elevation change	LiDAR difference raster	Selected cell -0.140906 m; broader pattern requires formal intersection.
25 Jan 2026	Pipe, trench and wet ground	DJI_0378.DNG; DJI_0447-DJI_0451	Drainage intervention and winter surface conditions.
10 Jul 2026	Southwest PHF / CBRP edge	DJI_0616(1).JPG and supporting screenshots	Dry-season endpoint within mapped lowering area.
16 Jul 2026	Southwest feature set	DJI_0748, 0758, 0774, 0775, 0803, 0829 and supporting DNGs	Scarp-hole group, pipe area, pale line, material manifestations and surface break.
July 2026	Former pond and horse-paddock relation	DJI_0874 / matched source frames; annotated image	Exact frame/date check still required.

Archive note: filenames in this appendix are based on the compiled observation register and the frames available in the current workspace. Before public release, all figure dates should be checked against original EXIF metadata and the project folder structure. No filename has been inferred where a reliable match was unavailable.